

EXHIBIT C

(Part 1 of 2)

Westlaw.

34 U.S.P.Q.2d 1167
1994 WL 681752 (S.D.N.Y.), 34 U.S.P.Q.2d 1167
(Cite as: 34 U.S.P.Q.2d 1167)

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Alpex Computer Corp.
v.
Nintendo Co. Ltd.

U.S. District Court Southern District of New York

No. 86 Civ. 1749 (KMW)

Decided December 5, 1994
United States Patents Quarterly Headnotes

PATENTS

[1] Infringement -- Construction of claims (Section 120.03)

Testimony of patent infringement plaintiff's expert witness is sufficient evidence to allow reasonable jury to conclude that patent for video game entertainment system does not require "on-board" read-only memory, which is read-only memory containing game instructions built into system's console.

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[2] Infringement -- Literal infringement (Section 120.05)

Infringement -- Doctrine of equivalents -- In general (Section 120.0701)

Sufficient evidence of equivalence exists between patent infringement defendant's "on-the-fly" display generation system for video game entertainment system, and claims for bit-map display system, for reasonable jury to find literal infringement pursuant to 35 USC 112(6), since reasonable jury could conclude that distinction between systems is insignificant and insufficient to defeat claim of equivalence under Section 112(6); such evidence also warrants finding that accused system infringes under doctrine of equivalents, in that equivalence under that doctrine is slightly broader than equivalence under Section 112(6).

PATENTS

[3] Patentability/Validity -- Date of invention -- In general (Section 115.0401)

Substantial evidence supports jury's finding that date of invention of video game entertainment system was on or before July 21, 1974.

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[4] Patentability/Validity -- Obviousness -- Relevant prior art -- Particular inventions (Section 115.0903.03)

Jury did not err as matter of law in determining that prior art cited by accused infringer was not more relevant than prior art considered by Patent and Trademark Office in granting patent for video game entertainment system.

PATENTS

[5] Patentability/Validity -- Obviousness -- Commercial success (Section 120.0908)

Substantial evidence supports jury's finding that success of accused video game system constitutes commercial success of patent in suit, in view of evidence showing that defendant attributed substantial profits of accused system to interdependence of consoles and cartridges, as disclosed by patent in suit; such factor should, however, be given little weight in overall obviousness determination, since other factors could also have contributed to defendant's success.

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[6] Patentability/Validity -- Obviousness -- Secondary considerations generally (Section 120.0907)

Patent infringement plaintiff presented sufficient evidence to allow issue of copying of its video game entertainment system to go to jury, and, although legitimate reasons exist for defendant's engineers to have had access to patent in suit, it cannot be said that no reasonable jury could have concluded that defendant copied patent in suit.

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[7] Patentability/Validity -- Obviousness -- Relevant prior art -- Particular inventions (Section 115.0903.03)

Patent infringement defendant has failed to prove, by clear and convincing evidence, that claims for video game entertainment system are obvious.

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[8] Infringement -- Construction of claims

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(Section 120.03)

Patent construction -- Claims -- In general
(Section 125.1301)**JUDICIAL PRACTICE AND PROCEDURE****Procedure -- Jury trials (Section 410.42)**

It was not error for federal district court, in patent infringement action, to give jury court's limited claim construction, leaving further refinement of that construction to jury, subject to court's review on motion for judgment as matter of law.

JUDICIAL PRACTICE AND PROCEDURE**[9] Procedure -- Jury trials (Section 410.42)**

Fact that jury in patent infringement action returned its verdict two hours after requesting television and console, presumably to play accused video games, does not mean that jury's verdict finding 118 of 146 games to be infringing was arbitrary and capricious, nor do jurors' remarks, on learning that second phase of trial would be held on damages, indicate that jurors had been eager to finish first phase of trial and had therefore rushed their deliberations.

REMEDIES**[10] Monetary -- Damages -- Patents -- Reasonable royalty (Section 510.0507.03)**

Patent infringement plaintiff's proof of damages as to reasonable royalty cannot be said to be inadequate, even though it emphasized infringer's actual profits as opposed to plaintiff's licensing history; evidence submitted to jury permitted jury to take into account, in its hypothetical negotiation analysis, reality of market in 1985, and its verdict, amounting to 6 percent running royalty applied to infringing sales between October 1985 and November 1992, is supported by substantial evidence, and is not unreasonable.

PATENTS**[11] Infringement -- Willful (Section 120.16)****REMEDIES****Monetary -- Damages -- Patents -- Increased damages (Section 510.0507.07)**

Evidence regarding willfulness of infringement of video game entertainment system, although not abundant, was sufficient to support reasonable jury's finding of willful infringement, especially in view of plaintiff's expert opinion testimony asserting that only written opinion of counsel predating defendant's decision to infringe was preliminary and could not

have supported good faith belief that accused device did not infringe; award of enhanced damages is not warranted, however, in view of closeness of case both as to willfulness and as to underlying issues of validity and infringement.

REMEDIES**[12] Monetary -- Damages -- Prejudgment interest (Section 510.0511)**

Award of prejudgment interest is warranted in action for infringement of patented video game system, despite defendant's assertion that jury's award alone is sufficient to place plaintiff in as good a position as if it had negotiated reasonable royalty with defendant prior to infringement; award should be based upon defendant's borrowing rate, which is commercial paper rate, and should be calculated upon after-tax basis.

REMEDIES**Particular patents -- General and mechanical -- Video games**

4,026,555, Kirschner and Haskell, television display control apparatus, not invalid; infringed.

*1169 Action by Alpex Computer Corp. against Nintendo Co. Ltd. and Nintendo of America Inc. for patent infringement. On defendants' motion for judgment as matter of law, or alternatively for new trial. Denied.

Prior decision: 20 USPQ2d 1782.

Barry L. Springel, John L. Strauch, Richard H. Saylor, Robert J. Hoerner, Marc L. Swartzbaugh, and Joseph D. Pollack, of Jones, Day, Reavis & Pogue, Cleveland, Ohio; Barry R. Satine and Jane A. Rue, of Jones, Day, Reavis & Pogue, New York, N.Y., for plaintiff.

John J. Kirby Jr., Robert J. Gunther Jr., Shelly B. O'Neill, Thomas G. Gallatin Jr., John T. Brennan, James S. Blank, Lisa K. Eastwood, Thomas N. Kendris, Gail A. Matthews, and Jeffrey T. Wald, of Mudge, Rose, Guthrie, Alexander & Ferdon, New York; David A. Vaughan, of Mudge, Rose, Guthrie, Alexander & Ferdon, Washington, D.C.; Larry S. Nixon, Robert W. Faris, and James J. Hosmer, of Nixon and Vanderhyde, Arlington, Va., for defendant.

Wood, J.

A four-week liability trial in this complex patent case resulted in a jury verdict for plaintiff Alpex Computer Corp. ("Alpex"). The jury concluded (1) that Nintendo Company, Ltd. and Nintendo of America, Inc. (collectively "Nintendo") had infringed claims 12 and 13 of U.S. Patent No. 4,026,555 (the "'555 patent'"), and (2) that the '555 patent was valid. The court subsequently conducted a two-week damages trial, at the conclusion of which the jury awarded damages of \$208,268,418.00 and concluded that Nintendo had willfully infringed the '555 patent. With respect to the liability trial, presently before the court are Nintendo's post-trial motions, pursuant to Rule 50(b), for (1) judgment of non-infringement as a matter of law, and (2) judgment of invalidity as a matter of law; and pursuant to Rule 59, for a new trial. With respect to the damages trial, presently before the court are Nintendo's motion for a remittitur or, in the alternative, for a new trial; and Alpex's motion for entry of judgment. For the reasons set forth below, the court denies defendants' motion for judgment of non-infringement as a matter of law; the court denies defendants' motion for judgment of invalidity as a matter of law; the court denies defendants' motion for a new trial of both liability and damages; the court denies defendants' motion for a remittitur or judgment as a matter of law on damages; and the court grants in part and denies in part Alpex's motion for entry of judgment.

LIABILITY

At issue in this litigation is whether the Nintendo Entertainment System (the "NES") infringes claims 12 and 13 of the '555 patent. [FN1] As is discussed in greater detail below, the '555 patent discloses certain video game technology. In 1990, Nintendo filed a motion for summary judgment on the ground that the '555 patent was invalid as anticipated under 35 U.S.C. Section 102, and as obvious under 35 U.S.C. Section 103. Alpex cross-moved for summary judgment of validity. In an Opinion and Order dated January 18, 1991 (the "1991 Opinion"), the court denied both motions, finding that the question of whether the '555 patent was invalid as obvious raised a dispute of material fact precluding summary judgment.

Just prior to trial, Nintendo filed a motion for summary judgment of non-infringement, claiming that the video display generation technology used by Nintendo differs from that disclosed in the '555 patent. The court denied Nintendo's motion as untimely, but granted Nintendo leave to reassert its motion during trial. At the completion of Alpex's case, Nintendo renewed its motion for judgment of

non-infringement as a matter of law. The court denied Nintendo's mid-trial motion, choosing to let the case go to the jury, and reserving the option of overturning the jury verdict later.

Pursuant to Fed. R. Civ. P. 50(b), Nintendo now renews its prior motions, seeking judgment as a matter of law that the '555 patent is invalid as obvious, and that the NES does not infringe the '555 patent. In the alternative, Nintendo moves for a new trial under Fed. R. Civ. P. 59.

DISCUSSION

I. Legal Standard for Judgment as a Matter of Law.

Fed. R. Civ. P. 50(a)(1) sets forth the standard for granting a motion for judgment as a matter of law:

***1170** If during a trial by jury a party has been fully heard with respect to an issue and there is no legally sufficient evidentiary basis for a reasonable jury to have found for the party with respect to that issue, the court may grant a motion for judgment as a matter of law against that party on any claim . . . that cannot under the controlling law be maintained without a favorable finding on that issue.

Such a motion may be granted only where "there is 'such a complete absence of evidence supporting the verdict that the jury's finding could only have been the result of sheer surmise and conjectures' or if the evidence is 'so overwhelming that reasonable and fair minded persons could only have reached the opposite result.' "Lambert v. Genesee Hosp., 10 F.3d 46, 56 (2d Cir. 1993) (quoting Sorlucco v. New York City Police Dep't, 971 F.2d 864, 871 (2d Cir. 1992)), *cert. denied*, 114 S. Ct. 1612 (1994). [FN2] In deciding a motion under Rule 50, made either before the verdict or after, the court may not weigh the evidence or pass on the credibility of witnesses, where credibility is at issue. Instead, the court must view the evidence most favorably to the party against whom the motion is made, and give that party the benefit of all legitimate inferences that may be drawn from the evidence. *See Samuels v. Air Transp. Local 504*, 992 F.2d 12, 14, 16 (2d Cir. 1993); *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.* 806 F.2d 1565, 1571 [1 USPQ2d 1081] (Fed. Cir. 1986). The non-movant may not, however, rest solely on general denials or conclusory statements. *See Johnston v. IVAC Corp.*, 885 F.2d 1574, 1578 [12 USPQ2d 1382] (Fed. Cir. 1989). The parties' arguments are discussed below, in light of the foregoing legal standard.

II. Claim Construction.

A. Background.

Infringement and validity of the '555 patent turn on how one interprets claims 12 and 13 of the '555 patent, which are set forth in their entirety in the margin. [FN3] The claims are the section of a patent "particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. Section 112. In the absence of an evidentiary conflict, claim interpretation is a question of law for the court. *Johnston*, 885 F.2d, at 1579-80. "But when the meaning of a term in the claim is disputed and extrinsic evidence is necessary to explain that term, then an underlying factual questions [sic] arises, and construction of the claim should be left to the trier or jury under appropriate instruction." *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 974 [226 USPQ 5] (Fed. Cir. 1985). To construe the claims, a court looks to the claim language, the accompanying specification, and the prosecution history of the patent. *Smithkline Diagnostics Inc. v. Helena Lab. Corp.*, 859 F.2d 878, 882 [8 USPQ2d 1468] (Fed. Cir. 1988). Other claims and expert testimony may also be relevant. *Id.*

Claim 12 of the '555 patent is written in "means-plus-function" form, which means that the invention is described in terms of what it does, rather than in terms of its physical structure. *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1042 [25 USPQ2d 1451] (Fed. Cir. 1993). Claim 13 is "dependent from" claim 12, in that it incorporates the structural limitations of means-plus-function claim 12 by reference. Means-plus-function claims such as claim 12 are expressly authorized by the Patent Act, *1171 which provides the following explicit instruction for interpretation of such claims:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. Section 112-6.

In the 1991 Opinion, the court concluded that in the first instance, claims 12 and 13 of the '555 patent are limited to the structure depicted in Figure 2 of the patent specification, except for the keyboard and television receiver. Opinion & Order, at 8-9, 13. Figure 2 is reproduced below [omitted]. Refining that

construction further, the court concluded that the apparatus disclosed by these claims includes (1) a microprocessor, and (2) replaceable memory in the form of modular, plug-in units. Opinion & Order, at 10-11, 13. The court derived these limitations by reference to the specification and prosecution history of the patent.

On Nintendo's motion, the court certified for appeal certain questions relating to the claim construction contained in the 1991 Opinion. The Federal Circuit declined to take the appeal, and Nintendo subsequently moved in this court for reconsideration of the court's claim construction. [FN4] To assist in reconsidering the claim construction, the court, with the consent of the parties, appointed a special master, Thomas L. Creel, from names submitted by the parties. On May 2, 1994, the special master conducted an evidentiary hearing to determine whether claims 12 and 13 require either replaceable memory and/or memory built into the game console, referred to by Nintendo, who advocated this construction, as "on-board ROM." Special Master Creel concluded in a May 7, 1994 Report ("Special Master's Initial Report") that the court had erred in previously limiting the ROM memory embodiment to "replaceable memory in the form of modular plug-in units." The Special Master's Initial Report is attached hereto as Appendix A [omitted]. The Special Master recommended that, as a matter of law, the court simply construe the memory embodiment as that depicted in Figure 2 of the patent specification. Noting a dispute between the parties' experts regarding certain specification language, the Special Master proposed that the court leave to the jury any further construction of the ROM memory element (i.e., whether it necessarily requires replaceable memory and/or "on-board ROM"). Special Master's Initial Report, at 21. The court adopted the Special Master's recommendation with the intention of either construing the claims further during trial but prior to instructing the jury, or giving the question of further claim construction to the jury.

At the court's request and with the parties' consent, during trial, Special Master Creel recommended further refinement of the claim construction, based on evidence presented at trial and additional briefing provided by the parties. See Supplemental Report of Special Master on Claim Construction of Claims 12 and 13 of United States Letter Patent Number 4,026,555 (June 1, 1994) ("Special Master's Supplemental Report"). [FN5] In his Supplemental Report, attached at Appendix B [omitted], the Special Master confirmed his earlier view that the court

should leave the question of further construction of the ROM memory embodiment for the jury. He also concluded that there could be no relevant file wrapper estoppel based on file history regarding claim 1 and the Okuda prior art, and that therefore the jury should not be instructed on file wrapper estoppel. In addition, the Special Master recommended instructing the jury that the term "linear player image" is different from the term "player image," but that precise identification of that difference should be left to the jury.

Finally, the Special Master recommended a construction of the video display technology claimed in the '555 patent. Construction of this element of the claimed technology had been hotly contested. Alpex had promoted a construction limited only by the block diagram depicted in Figure 2, while Nintendo urged a construction of the display system that it labelled "bit-mapping," as opposed to "on-the-fly" technology used in the NES. Finding both proposals too simplistic, the Special Master recommended that the jury be instructed as follows:

***1172** The structure corresponding to the elements of claim 12 and 13 for generating a video signal is the Figure 2 components without the television receiver and the keyboard. These components cooperate together to create a video signal as follows: The linear player image device and the ball image device to be displayed on the video unit 30 are stored as data within ROM 42A. The "intelligence" of the system is provided by micro-processor 40. The operation of the micro-processor 40 is under the control of a program stored in ROM 42A. Micro-processor 40 causes this information in ROM 42A to be written into RAM 32 by using the write control circuit 38. RAM 32 has discrete storage positions which correspond to each to the bars or pixels of the TV screen. TV interface 36 causes display RAM address 34 to scan each of these storage positions in display RAM 32 to provide the video signal to the TV receiver 30.

Although more detailed, the Special Master's construction was closer to the "on-the-fly" construction advanced by Nintendo than the "Figure 2" construction proposed by Alpex. Notwithstanding his recommendation that the court instruct the jury as set forth above, the Special Master noted that in the alternative, the court might choose to leave further claim construction to the jury, reserving the option of reviewing the jury's construction on a post-verdict motion for judgment as a matter of law. *See* Special Master's Supplemental Report, at n.1. Before instructing the jury, the court adopted the Special

Master's recommendations regarding the ROM memory embodiment, file wrapper estoppel, and the player image element. (Trial Transcript (hereinafter "Tr."), at 3806) With respect to the Special Master's recommended construction of the video display technology, however, the court deferred ruling, choosing instead to give the jury a partial claim construction, along with instructions on how to refine that construction further. *Id.* To guide the jury in refining the construction further, the jury verdict form requested that the jury choose between the parties' constructions, i.e., (1) whether or not "claims 12 and 13 require a structure that includes a display RAM which has discrete storage positions which correspond to each of the bars or pixels of the TV screen;" and (2) whether or not "claims 12 and 13 require 'on board ROM,' that is read-only memory containing game instructions built into the console of the NES." *See* Memorandum of Law in Support of Nintendo's Motion for Judgment of Patent Invalidity as a Matter of Law (hereinafter "Nintendo's Invalidity Mem."), Exh. A (hereinafter "Liability Verdict Form"), at 1. The jury answered the first of these two questions "yes," that is, adopting a construction of the display technology consistent with the positions advanced by both Nintendo and the Special Master. The jury answered the second of these two questions "no," thereby adopting a construction of the ROM memory embodiment consistent with the view advanced by Alpex. *See id.* The jury also apparently concluded that 118 of the 149 accused games contained the requisite linear player image and ball image, as they defined those terms. In its post-trial motions, Nintendo attacks the jury's claim construction, as well as the infringement and validity conclusions that the jury drew from its claim construction. Accordingly, set forth below is my claim construction of the video display element, the ROM memory element, and the linear player image and ball image elements, to the extent that these elements can be construed by the court as a matter of law.

B. Video Display Technology.

As noted above, the jury verdict form directed the jury to determine whether or not "claims 12 and 13 require a structure that includes a display RAM which has discrete storage positions which correspond to each of the bars or pixels of the TV screen." The jury answered this question in the affirmative, as had been urged by counsel for Nintendo. The wording of the construction proposed in this question was not as elaborate as the construction recommended by the Special Master, but

it was explicitly taken from the Special Master's recommended construction, and it was designed to give the jury an opportunity to select the construction advocated by both Nintendo and the Special Master. [FN6]

*1173 On June 2, 1994, after the jury returned its verdict, I issued an oral order formally adopting the claim construction recommended in the Special Master's Supplemental Report, including the portions regarding construction of the video display technology on which I had previously deferred ruling. (Tr. 4024) Because the jury's verdict was consistent with these portions of the Special Master's Supplemental Report, my adoption of those portions was not intended to overrule the jury's claim construction of the video display technology, but to endorse it. Nonetheless, Nintendo maintains that had the jury been given the more elaborate construction advanced by the Special Master (rather than being left to construe the video display technology on its own), the jury would have had to come to a different conclusion on infringement. Therefore, my analysis of Nintendo's motion must address that contention. For substantially the reasons set forth in the Special Master's Supplemental Report, I find that as a matter of law, the video display technology disclosed in claims 12 and 13 of the '555 patent is that described by the Special Master in his Supplemental Report and excerpted *supra*. [FN7] To the extent that my instructions to the jury did not fully reflect that construction, I consider *infra* whether different instructions would have led to a different result.

B. ROM Memory Element.

As with the video display technology, the jury verdict form specifically asked the jurors to construe the ROM memory element of claims 12 and 13. More specifically, the verdict form asked whether "claims 12 and 13 require 'on board ROM,' that is read-only memory containing game instructions built into the console of the NES." The jury determined that the claims do not have this requirement, the outcome that had been urged by counsel for Alpex. In its motions for judgment of non-infringement and invalidity as a matter of law, Nintendo attacks the jury's construction of the ROM memory element, and the jury's infringement and validity findings based on that construction.

As noted *supra*, the court has considered the proper construction of the ROM memory element on several occasions. The issue was first addressed in the 1991 Opinion, where the court concluded that claims 12

and 13 require "replaceable memory in the form of modular plug-in units." The court reconsidered this construction pre-trial with the help of the Special Master, who recommended that the court withdraw this construction, limiting the ROM memory element as a matter of law only to ROM 42A, as depicted in Figure 2. The Special Master recommended that further refinement of this construction be left to the court or the jury at trial. The court adopted the Special Master's recommendation, and the case proceeded to trial. At the conclusion of trial, but before the case went to the jury, the Special Master reconsidered and reaffirmed his conclusion that the record presented a dispute of fact best resolved by the jury. In the alternative, he noted that the court could resolve the issue, but only by discounting the testimony of Alpex's expert, Ronald Milner. The court adopted his recommendation that further refinement of the ROM memory element be left to the jury. As noted above, the jury explicitly concluded that the claims do not require on-board ROM.

In its Motion for Judgment of Non-Infringement, Nintendo argues that based on the patent specification, the patent file history, and expert testimony offered at trial, the court must conclude that the '555 patent requires on-board ROM as a matter of law. As the special master noted, the evidence on this issue reflects a dispute between the parties' experts. Nintendo argues that the testimony of Alpex's expert, Ronald Milner, is conclusory and therefore insufficient to create a dispute of fact precluding judgment as a matter of law.

Having reviewed the testimony at issue, I find that it is not merely conclusory, and that it provides sufficient basis for a reasonable jury to conclude that the '555 patent does not require on-board ROM. More specifically, I note that Mr. Milner testified accurately that neither the patent nor its file history contains the terms "on-board ROM" or "resident ROM." (Tr. 3512-13) Mr. Milner's testimony addressed each reference in the patent specification about which Nintendo's expert, Dr. Stephen Ward, had testified. Mr. Milner explained why, contrary to Dr. Ward's testimony, these references do not specify a requirement of on-board ROM. (Tr. 3514-18) For instance, Dr. Ward testified that references in the specification, to the invention functioning as a calculator, to a menu of game options, and to initializing sub-routines, would indicate to a person of ordinary skill in the art that the invention contained on-board ROM. Mr. Milner countered*1174 that nothing about any of these

characteristics indicated to him that on-board ROM was required, and that each of these characteristics could be present if the ROM were contained in cartridges (as opposed to built into the console). (Tr. 3514-17)

[1] Nintendo emphasizes that in his supplemental report the Special Master noted that the court could disregard the foregoing Milner testimony and construe the claims as requiring on-board ROM. In suggesting that the court could disregard Mr. Milner's testimony, the Special Master did nothing more than summarize Nintendo's position in its mid-trial motion for judgment as a matter of law. In leaving construction of the ROM memory element to the jury, I determined that I could not, as a matter of law, disregard the Milner testimony. Similarly on the instant motion I cannot weigh the evidence or disregard the competent testimony of an expert. D.M.I., Inc. v. Deere & Co., 802 F.2d 421, 425 [231 USPQ 276] (Fed. Cir. 1986) ("A trial judge presented with a motion for JNOV (1) must consider all the evidence in a light most favorable to the non-mover, (2) must not determine credibility of witnesses, and (3) must not substitute his or her choice for the jury's in finding facts, drawing inferences, or deciding between conflicting elements in the evidence."). Finding sufficient evidence upon which a reasonable jury could conclude that claims 12 and 13 do not require on-board ROM, I decline to overrule the jury's conclusion with respect to this issue of claim construction. To the extent that Nintendo's motion for judgment of non-infringement as a matter of law is based on its contention that the claims require on-board ROM, that motion is denied.

A corollary to the jury's reasonable conclusion that the claims do not require on-board ROM, is a finding that both claims contemplate the use of replaceable memory, either with or without on-board ROM. [FN8] The construction of this replaceable memory element bears on the jury's finding that the patent was not invalid as obvious. Citing prior art video game systems with replaceable memory, Nintendo attacks the jury's conclusion that the patent is valid. Alpex distinguishes the prior art cited by Nintendo on the ground that it lacks replaceable memory in the form of ROM cartridges. The parties' arguments present the question of whether the jury could permissibly conclude that the replaceable memory element of the claims is limited to replaceable ROM cartridges. As an initial point, I note that both parties have agreed with the court's construction of the claims as limited to the structure disclosed in figure 2, which

represents the memory element containing game instructions as ROM 42A. This construction limits the memory element to ROM memory, regardless of whether it is replaceable. Moreover, having reviewed the testimony on this issue, I find substantial evidence on the basis of which a reasonable jury could construe the replaceable memory element as replaceable ROM cartridges. More specifically, Mr. Milner testified as one of ordinary skill in the art that "[r]eplaceable memory in the context of this patent means something that you can change the games with quickly and easily and that really means a memory cartridge, a ROM cartridge." (Tr. 1799; *see also* tr. 1802-04) Mr. Milner distinguished memory in the form of replaceable ROM cartridges from "storage media," such as the audio cassette tapes used with certain prior art. (Tr. 3554-55)

Nintendo argues that Mr. Milner's construction of the replaceable memory element is erroneous as a matter of law, because it is impermissibly based on the specification. Nintendo's objection is unfounded. To the extent that Mr. Milner looked to the specification to construe the memory element of means-plus-function claim 12, his analysis was dictated by section 112(6). *See In re Donaldson*, 16 F.3d 1189, 1195 [29 USPQ2d 1845] (Fed. Cir. 1994). As for claim 13, reference to the specification was entirely appropriate as necessary to construe the specific term "replaceable memory." *See E.I. Du Pont de Nemours & Co. v. Phillips Petroleum*, 849 F.2d 1430, 1433 [7 USPQ2d 1129] (Fed. Cir. 1988) (distinguishing properly looking to the specification "to interpret what the patentee meant by a word or phrase in the claim" from improperly reading a limitation into a claim from the specification "wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim.") Accordingly, I find no legal error in Mr. Milner's testimony regarding the replaceable memory element. If the jury used Mr. Milner's construction for purposes of consideration of the prior art, it does not constitute a ground for judgment of invalidity as a matter of law.

C. Linear Player Image and Ball Image.

*1175 In its motion for judgment of non-infringement as a matter of law, Nintendo claims that there was insufficient evidence for a reasonable jury to conclude that its video games contain the linear player image and ball image required by claims 12 and 13 of the '555 patent. As noted *supra*, in the Special Master's Supplemental Report, the Special Master recommended that the jury be instructed that

the term "linear player image" in claims 12 and 13, is distinguishable from the term "player image" used in other claims. The special master recommended that further construction of those terms be left to the jury. The court adopted this recommendation and instructed the jury that the terms have different meanings. The jury was left to determine the meaning of these terms, as well as the meaning of "ball image," as that term is used in the patent. To assist the jury in this task, the court provided general instructions regarding claim construction. The jury verdict form did not contain specific questions directed to claim construction of these terms, so the jury's conclusions regarding the meaning of these terms are revealed only through its findings of infringement. To the extent that Nintendo's motion with respect to these elements is a motion for the court to construe these terms as a matter of law, the court denies the motion for the reasons set forth below.

The doctrine of claim differentiation provides that "[w]here some claims are broad and others narrow, the narrow claim limitations cannot be read into the broad whether to avoid invalidity or to escape infringement." *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1574 [225 USPQ 236] (Fed. Cir. 1985) (quoting *Deere & Co. v. Int'l Harvester Co.*, 658 F.2d 1137, 1141 [211 USPQ 11] (7th Cir.), cert. denied 454 U.S. 969 (1981)). By instructing the jury regarding the distinctness of the terms "linear player image," found in claim 12, and "player image," found in other claims, the court drew the legal conclusion dictated by the doctrine of claim differentiation. Any further construction of these terms requires weighing the conflicting testimony of the parties' experts regarding the meaning of these terms to one of ordinary skill in the art.

As an initial point, I note that the construction of the terms "linear player image" and "player image" is a question that is well suited to clarification through expert testimony. See *Snellman v. Ricoh Co. Ltd.*, 862 F.2d 283, 287 [8 USPQ2d 1996] (Fed. Cir. 1988), cert. denied, 491 U.S. 910 (1989). Nintendo suggests that "linear player image" should be interpreted by reference to ordinary English usage. Nintendo's Non-Inf. Mem., at 56. Although the terms of a patent claim should be given their ordinary English meaning where possible, *Envirotech Corp. v. Al George, Inc.*, 730 F.2d 753, 759 [221 USPQ 473] (Fed. Cir. 1984), that meaning is by no means clear here, where the dictionary definition of "linear" is "of or relating to a line," *Webster's Third New International Dictionary*, 1315 (1976). As Nintendo's expert Dr.

Stephen Ward conceded, the line between a linear image and a non-linear image is a difficult one to draw. (Tr. 3239, 3246)

Alpex's expert, Ronald Milner, testified that a "linear player image," as opposed to a "player image," is a "player device that you can tell what direction it's pointing, . . . so you could tell that it had rotated." (Tr. at 1795) Nintendo argues that in proposing this broad construction of a "linear player image," Mr. Milner impermissibly eliminated any distinction between that term and "player image," as used in claim 14 of the '555 patent. Claim 14 discloses a "means for moving said player image device linearly and for rotating said player image device." Nintendo argues that for the rotation required by claim 14 to be perceptible, the required "player image" would have to be indistinguishable from a "linear player image," as defined by Mr. Milner. Nintendo claims that this result is contrary to the court's claim construction that these two terms have distinct meanings. I do not agree that Mr. Milner's reading of the term "linear player image" necessarily runs afoul of my claim construction. As Alpex points out, "[t]he fact that, in Milner's opinion, the separate requirement of rotation in claim 14 further limits the 'player images' covered by that claim and may result in the scope of claims 12 and 13 being the same in terms of player images covered, does not change his opinion that the two terms, standing alone, are different in the way he described." Alpex's Memorandum in Opposition to Post-Trial Motion for Judgment of Non-Infringement (hereinafter, "Alpex's Non-Inf. Mem."), at n.15. Thus, when asked whether "linear player image," as used in claim 12, is narrower than "player image," as used in claim 14, Mr. Milner testified:

I'm not sure if in the context of these claims in this patent that's true because in Claim 14, to tell rotation you would still have to be able to tell rotation to have -- it refers to a rotating player image. If you couldn't tell, you wouldn't have rotation. And what I inferred about linear was just a more specific thing about how you could tell that it rotated.

*1176 (Tr. 2106) (emphasis added). If the jury found Mr. Milner's definition of "linear player image" more compelling than that proposed by Nintendo's expert, its conclusion was neither contrary to law nor unreasonable.

As noted above, Nintendo also challenges Mr. Milner's interpretation of the term "ball image," as used in the '555 patent. Mr. Milner testified that the

"ball image" element in claims 12 and 13 requires neither continuous ball movement nor deflection. (Tr. 2161-64) Nintendo argues that this construction is erroneous as a matter of law, because it is contrary to the following description of a "ball image," which is set forth in the specification at Column 2, lines 33-38:

The image device which moves continuously until deflected by another image device is referred to as a ball whether the game is considered to be tennis or hockey, or whether the continuously movable image device is intended to represent a missile or the like.

Nintendo is correct in asserting that a patentee can serve as his own lexicographer, but he is bound by the meaning he gives to certain terms. See *ZMI Corp. v. Cardiac Resuscitator Corp.*, 844 F.2d 1576, 1580 [6 USPQ2d 1557] (Fed. Cir. 1988). I cannot conclude, however, that Mr. Milner transgressed this rule of claim construction. First, I note that the specification explicitly presents the foregoing definition as "a particular example" of the claimed invention. (Tr. 2125) Mr. Milner cited other examples of ball images in the patent specification that are not limited by requirements of continuous movement and deflection. (Tr. 2162-63) Moreover, reference in claims other than claims 12 and 13, to a ball image that is continuously moving and subject to deflection, suggests that the term, as used in claims 12 and 13, is not so limited. See *D.M.I., Inc.*, 755 F.2d at 1574. Finally, even if the meaning of the term were limited by the definition cited by Nintendo, that definition suggests a broad conception of both continuous movement and deflection, in that a hockey puck does not necessarily move continuously and a missile is not generally deflected. In light of the foregoing, I cannot conclude that Mr. Milner's construction of the "ball image" was erroneous as a matter of law.

Nintendo's motion, as it applies to the "linear player image" and "ball image," is directed not only to the construction of those elements, but also to the finding of infringement based on those constructions. This latter issue is addressed *infra* in connection with the court's analysis of the jury's infringement verdict. Having construed the relevant patent claims, to the extent possible as a matter of law, the court turns to consideration of the jury's infringement and validity findings.

III. Infringement.

As a basis for its motion for judgment of non-

infringement as a matter of law, Nintendo identifies three characteristics of the NES that purportedly put it outside the scope of the '555 patent. More specifically, Nintendo argues that (1) its "on-the-fly" display generation system does not infringe the bit-map display system either literally or under the doctrine of equivalents; (2) the '555 patent requires "on-board ROM," which the NES lacks; and (3) there was insufficient evidence to support the jury's conclusion that the accused NES games had the linear player image required by the '555 patent. Having considered each of these three arguments, as set forth in detail below, I hold that a reasonable jury could conclude that the NES infringes claims 12 and 13 of the '555 patent.

A. Video Display Technology.

As noted above, Nintendo maintains that the NES does not infringe the '555 patent either literally, or under the doctrine of equivalents, because its video display generation system is substantially different from that required by the '555 patent. The video display generation system in the NES and that disclosed in the '555 patent (as construed by the jury and the Special Master in the Supplemental Report adopted by the court) are not identical in structure. Therefore, with respect to this element, the infringement dispute centers on whether the two display systems are equivalent under either section 112(6), or the doctrine of equivalence. See *Alpex's Non-Inf. Mem.*, at 8; Reply Memorandum of Law in Support of Nintendo's Motion for Judgment of Non-Infringement as a Matter of Law ("Nintendo's Non-Inf. Reply Mem."), at 8-9.

1. The legal definition of equivalents under section 112(6) and the doctrine of equivalence.

In *Texas Instruments Inc. v. United States Int'l Trade Comm'n.*, 871 F.2d 1054 [10 USPQ2d 1257] (Fed. Cir. 1989), the Court of Appeals for the Federal Circuit suggested in dictum that there are similarities between equivalence analysis under section 112 and under the doctrine of equivalents. In subsequent decisions, however, the Court of Appeals has repeatedly held that "section 112, paragraph 6, and the doctrine *1177 of equivalents have separate origins and purposes." *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1043-44 [25 USPQ2d 1451] (Fed. Cir. 1993); see also *In re Donaldson Co.*, 16 F.3d 1189, n.8 [29 USPQ2d 1845] (Fed. Cir. 1994); *Intel Corp. v. U.S. Int'l Trade Comm'n.*, 946 F.2d 821, 842 [20 USPQ2d 1161] (Fed. Cir. 1991); *D.M.I., Inc.*, 755 F.2d at 1575.

Decisional law suggests two distinctions between "equivalents" under section 112(6) and "equivalents" under the doctrine of equivalence. First, under section 112(6), equivalents are identified by reference to the structure disclosed in the specification. These equivalents literally meet the claim and actually mark the bounds of the claims. By contrast, equivalents under the doctrine of equivalence are measured by reference to the structure disclosed in the claims. These equivalents fall outside the literal bounds of the claimed invention, and serve to extend the coverage of the patent beyond the literal claims. See *Valmont Indus., Inc.*, 983 F.2d at 1043 ("An equivalent under the doctrine of equivalents results from an insubstantial change which . . . adds nothing of significance to the claimed invention. . . . In the context of section 112, however, an equivalent results from an insubstantial change which adds nothing of significance to the structure, material, or acts disclosed in the patent specification.") (emphasis added).

The second distinction between section 112(6) and the doctrine of equivalence is that section 112(6) requires an identity of function between the claimed invention and the accused device. *Id.* at 1042-43. Equivalence analysis under section 112(6), therefore, is limited to comparison of the structures at issue. [FN9] *Id.* (" '[T]he sole question' under section 112 involves comparison of the structure in the accused device which performs the claimed function to the structure in the specification."). By contrast, the doctrine of equivalence involves an equitable tripartite test, which defines an equivalent as a device that " 'performs substantially the same overall function or work, in substantially the same way, to obtain substantially the same overall result as the claimed invention.' " *Id.* (quoting *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 934 [4 USPQ2d 1737] (Fed. Cir. 1987), cert. denied, 485 U.S. 961, and cert. denied, 485 U.S. 1009 (1988)). The doctrine of equivalence therefore contemplates equivalents of the claimed invention that differ, albeit unsubstantially, with respect to function and result, as well as with respect to the structure or way in which the device operates.

In sum, the distinctions between section 112(6) and the doctrine of equivalence outlined above suggest that the doctrine of equivalence is a somewhat broader concept. See *Lairam Corp. v. Rexnord, Inc.*, 939 F.2d 1533, 1539 [19 USPQ2d 1367] (Fed. Cir. 1991) (inquiry of equivalency under the doctrine of equivalence "may not be as limited as under section

112(6)"). While an accused device might not literally infringe as a section 112 equivalent, it nonetheless could be found to infringe as a substantial equivalent under the doctrine of equivalents. See *Texas Instruments, Inc. v. United States Int'l Trade Comm'n*, 805 F.2d 1558, 1571 [231 USPQ 833] (Fed. Cir. 1986) ("When literal infringement under section 112 paragraph 6 is not present the doctrine of equivalents may nevertheless apply, and thereby secure to the patentee the fair scope of the patent"). On the basis of differences between the NES video display system and that disclosed in the patent, Nintendo maintains that the jury erred as a matter of law in concluding that the NES was an equivalent under either section 112(6) or the doctrine of equivalents. The parties' arguments with respect to each of these two forms of equivalence are discussed below.

2. Equivalence analysis under section 112(6).

Nintendo claims that the jury erred as a matter of law in finding equivalence under section 112(6) between its video display technology, known as the Picture Processing Unit ("PPU"), and the "bit-map" structure disclosed in the patent specification. Nintendo maintains that no reasonable jury could have concluded that the PPU adds nothing of significance to the invention claimed in the '555 patent, as construed by the special master and the court. I note that there appears to be no dispute that the two systems have the identity of function required for a finding of equivalence under section 112(6), so the inquiry is limited to whether they have equivalent structures. See Nintendo's Non-inf. Mem. at 15.

In support of its position Nintendo cites trial testimony identifying several distinctions between the "bit-map" technology disclosed in the '555 patent and the "on-the-fly" *1178 technology used in the NES. [FN10] More specifically, Nintendo argues that allegedly uncontroverted testimony demonstrated that:

* An Alpex bit-map system stores a complete digital representation of a video image in a display RAM, before the image appears on the screen, whereas the NES on-the-fly system does not store the image before it reaches the TV screen.

* An Alpex bit-map system requires that each object be erased and rewritten in the display RAM in order to show movement or rotation of the object, whereas the NES on-the-fly system does not require erasing and rewriting to show movement.

* An Alpex bit-map system enables control of each pixel or dot on the TV screen, whereas the NES on-the-fly system can control only a stamp on the screen.

* As compared to the Alpex bit-map system, the NES on-the-fly system requires substantially less memory, costs less, and is faster in generating video images.

* Due to their relative advantages and disadvantages, on-the-fly systems such as Nintendo's PPU became the method of choice for persons of ordinary skill in the art designing video games, whereas bit-map systems such as Alpex's are preferred by those designing personal computers.

Nintendo argues that these differences between the two video display systems are significant, as illustrated not only by the expert testimony at trial, but also by evidence of "real world" choices between the two technologies that each of the technical witnesses have made. Nintendo claims that any contrary testimony by Alpex expert Ronald Milner was unsupported, conclusory, and contrary to law.

In response, Alpex asserts first that there was ample evidence in Mr. Milner's testimony on which the jury could have concluded that the NES display technology is equivalent to that disclosed in the '555 patent'. Second, Alpex claims that the distinguishing characteristics Nintendo emphasizes are no more than features added to the basic invention claimed in the '555 patent', and as such, these characteristics do not enable Nintendo to escape a finding of infringement. See *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1057 [5 USPQ2d 1434] (Fed. Cir.), cert. denied, 488 U.S. 825 (1988).

[2] Having carefully reviewed the trial testimony, I find that there was sufficient evidence of equivalence between a "bit-map" system and an "on-the-fly" system for a reasonable jury to find literal infringement under section 112(6). Mr. Milner's testimony regarding infringement was based, in part, on his conclusion that claims 12 and 13 should not be construed as limited to a "bit-map" system. This construction has of course been rejected by the special master, the court, and the jury. However, Mr. Milner testified in the alternative that were claims 12 and 13 construed as limited to a "bit-map" system, he would still consider the NES PPU an equivalent structure. (See Tr. 1899, line 18 - 1911, line 11; Tr. 3528-30, 3543-47). More specifically, in his direct testimony

he discussed the bit-map and on-the-fly technologies as alternative technologies for computers to keep up with very fast television beams. (Tr. 1901-02) Mr. Milner characterized both technologies as a "crib note," whereby data is temporarily stored before being displayed on the television screen. (Tr. 1902, 1908) In slightly more technical terms, he explained the manner in which a "bit-map" system creates a display as follows:

[I]f we want to display an image on the screen using the bit-map technique that is described in the '555 patent', what we do is we make a copy ahead of time of this bit-map into this display RAM. And essentially what we do is we have locations in this RAM corresponding to each position on the screen. We've divided the screen up into some arbitrary resolution. Suppose we want to display our image in the lower right-hand corner of the TV screen. What we do is we have this RAM organized parallel to the screen. The microprocessor loads this data into this RAM during the time that the beam is off the screen.

(Tr. 1905) He went on to explain how the bit-mapped image is read out of memory onto the television screen line by line, summarizing '*1179' the system as one by which "a full screen bit-map transfers an image that is stored in this memory, loaded by the microprocessor into this display RAM, put out on to the TV screen at the right time to make the picture of the little guy." (Tr. 1906) Turning to the NES PPU, Mr. Milner explained that video display system as follows:

What happens in those 2 millionths of a second, when it's time to display the top of the head of this image is the first line is fetched from the character ROM and put in a little bit of temporary storage, which is the PPU. . . . They don't hold the whole line. One of them holds this top line here, the other one holds this blank top line here. When the beam is going across and it's time to display these when the positions match, this little bit of information that had been in this temporary shift register gets spit out, goes through some additional circuitry and turns the beam on and off on the screen to paint the top of his head. . . . We do this over and over. We do one line and then the next and then the next, using the same hardware over and over, but still storing it until -- little bit at a time -- until we have put the entire image out to the screen.

(Tr. 1908-09) Significantly, Mr. Milner testified that it was not quite accurate to characterize the NES PPU as an "on-the-fly" system, because contrary to

Nintendo's assertions, the images, or pieces of them, are temporarily stored by the PPU before being displayed on the television screen. (Tr. 1910; 2011-12).

On redirect, counsel asked Mr. Milner specifically to assume that "Claim 12 requires the microprocessor 40 in figure 2 to cause information in ROM 42A to be written into RAM 32 by using the write control circuit 38" and that "RAM 32 of figure 2 [has] discrete storage positions which correspond to each of the bars or pixels on the TV screen," i.e., that claims 12 and 13 require a "bit-map" display system. (Tr. 3543-44) Mr. Milner then testified that he considered the NES PPU an equivalent to a "bit-map" system. He explained his analysis as follows, referring first to the PPU, and then to a "bit-map" system:

The shift registers that, this temporary storage that we have heard a little bit about store the object one line at a time. They store it just one little slice of an object. This one stores the whole screen. And the reason that they are equivalent is by storing one line at a time and using it over and over and over again very quickly you can do the same thing. Using it over and over is a very equivalent thing to having a big board of it.

(Tr. 3544). Turning to the mechanism by which the images are relayed to the television screen, Mr. Milner explained his equivalence analysis as follows, again referring first to the PPU, and then to the "bit-map" system:

[B]asically a shift register is very much like the conveyor belt that we saw in the [movie], it automatically goes along, dumps out one bit at a time to the screen. The TV interface in figure 2 actually has a counter connector to a random access memory, and it counts through in a fixed fashion going through one location after another. And a counter operating a RAM is a very equivalent structure to a shift register. It can't skip a cell, it go [sic] here, it can't go here. It goes through one cell after another just like the conveyor belt rolls them off.

(Tr. at 3545-46).

The primary difference between the structures of the display generation systems that emerges from Mr. Milner's testimony is that one stores the picture in pieces or stamps which are read out piece by piece onto the screen, while the other stores a fully constructed picture which is read out line by line onto

the screen. Even if it were fully instructed with respect to the Special Master's claim construction, a reasonable jury could conclude, as apparently Mr. Milner has, that this distinction between a "bit-map" system and the NES PPU is insignificant and insufficient to defeat a claim of equivalence under section 112(6).

To conclude otherwise, I would have to disregard Mr. Milner's testimony in favor of that of Nintendo's expert, Dr. Stephen Ward. Contrary to Nintendo's assertions, the Milner testimony recounted *supra* is neither conclusory nor unsubstantiated. Using several demonstrative exhibits, Mr. Milner gave the lay jury a reasonably detailed explanation of his analysis of the equivalence between these highly technical systems. It is not for the court on a motion for judgment as a matter of law to weigh the credibility of witnesses or to disregard such testimony. See *Weldy v. Piedmont Airlines, Inc.*, 985 F.2d 57, 59-60 (2d Cir. 1993); *Palumbo v. Don-Joy Co.*, 762 F.2d 969, 976 [226 USPQ 5] (Fed. Cir. 1985). In addition, notwithstanding testimony about differences in the cost, speed, and favored applications of the two technologies, a finding of equivalence is supported by other witnesses' testimony describing their choices between the two technologies. (see, e.g., Tr. 745-46, 753) Nintendo reads this testimony as proof that people of *1180 ordinary skill in the art, including the inventors, have long been aware of the differences between the two display systems, and that they have specifically chosen one system or the other based on these differences. However, an alternative reading of this testimony could be that although each technology has its advantages, the two systems are basically interchangeable. See *Palumbo*, 762 F.2d at 975 (" 'An important factor [in the determination of equivalents] is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.' ") (quoting *Graver Tank & Mfg. Co. v. Linde Air Products Co.*, 339 U.S. 605, 609 [85 USPQ 328] (1950)).

In light of the foregoing considerations, drawing all inferences in favor of Alpex, I conclude that a reasonable jury could find by a preponderance of the evidence that the NES PPU is a section 112(6) equivalent of the "bit-map" system claimed in claims 12 and 13, as construed by the special master and the court.

3. Equivalence under the Doctrine of Equivalents.

Nintendo challenges the jury's finding of

equivalence with respect to the display technology under the doctrine of equivalents, as well as under section 112(6). Because, as discussed *supra*, equivalence under the doctrine of equivalents is a slightly broader concept than equivalence under section 112(6), my conclusion that a reasonable jury could have found equivalence under 112(6) applies equally well (if not with even greater force) in the context of the doctrine of equivalents. In its motion papers, however, Nintendo raises several objections to the jury's verdict that are peculiar to the doctrine of equivalents. First, Nintendo argues that the doctrine of equivalents is an equitable remedy that "only comes into play when an unscrupulous infringer attempts to evade the literal terms of the claims of a patent," a showing that Nintendo claims was not made here. Second, Nintendo claims that the patent it obtained on the PPU is relevant to equivalence under the doctrine of equivalents, and that this evidence, together with that cited in connection with its section 112(6) argument, establish non-equivalence. Third, Nintendo complains that in violation of the Federal Circuit's decision in *Lear Siegler Inc. v. Sealy Mattress Co.*, 873 F.2d 1422 [10 USPQ2d 1767] (Fed. Cir. 1989), Alpex's proof on the doctrine of equivalents lacked a sufficient explanation of why the overall function, way, and result of the Nintendo display system is substantially the same as a bit-map display system. I have considered each of these objections, as set forth below, and concluded that none of them provides a sufficient basis for overturning the jury's conclusions with respect to equivalence between the video display systems under the doctrine of equivalents.

The question of whether the doctrine of equivalents is applicable to a case, absent a showing of inequitable conduct, was thoroughly briefed and debated during trial. It is also the subject of the appeal in *Hilton Davis Chemical Co. v. Warner-Jenkinson Co.*, Appeal No. 93-1088 (Fed. Cir., argued Mar. 1994), currently pending *en banc* before the Federal Circuit Court of Appeals. As Nintendo points out in its brief, there is some evidence in recent decisional law that the Federal Circuit is moving toward a new conception of the doctrine of equivalents, requiring not only a showing of equivalence under the tri-partite function/way/result test articulated in *Graver Tank & Mfg. Co. v. Linde Air Prods Co.*, 339 U.S. 605 [85 USPQ 328] (1950), but also a showing of inequitable conduct on the part of the alleged infringer. See *Charles Greiner & Co. v. Mari-Med Mfg., Inc.*, 962 F.2d 1031, 1036 [22 USPQ2d 1526] (Fed. Cir. 1992); *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 [20 USPQ2d

1456] (Fed. Cir. 1991); *Slimfold Mfg. Co. v. Kinkead Indus., Inc.*, 932 F.2d 1453, 1457 [18 USPQ2d 1842] (Fed. Cir. 1991). As I noted at trial, however, none of the foregoing decisions unequivocally amends the time-honored *Graver Tank* test. (Tr. 3332) In the absence of such an unequivocal statement, I decline to find error in the jury's doctrine of equivalents conclusion on this basis.

As a second basis for attacking the jury's doctrine of equivalents finding, Nintendo claims that in addition to evidence of the difference between the PPU and a "bit-map" system noted above, "[t]he patent examiner's decision to grant Nintendo a patent [on the PPU] over the Alpex patent further establishes that Nintendo's on-the-fly system is not equivalent to Alpex's bit-mapped system." Nintendo's Non-Inf. Mem., at 40-1 (emphasis added). In support of this argument, Nintendo cites *Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948 [28 USPQ2d 1936] (Fed. Cir. 1993). The *Hoganas* court noted that the issuance of a patent for an accused product is relevant to the question of equivalence under the doctrine of equivalents. *Id.* at 954. Accordingly, prior to trial, I denied Alpex's motion *in limine* to exclude evidence of Nintendo's PPU patent. I also instructed the jury that they could consider the PPU *1181 patent in connection with their analysis. (Tr. 3973) While the PPU patent may be relevant to the question of equivalence, however, it does not "establish" non-equivalence. Nothing in the *Hoganas* decision alters the rule that issuance of a patent is not a defense to infringement. See *Atlas Powder Co. v. E.I. du Pont de Nemours & Co.*, 750 F.2d 1569 [224 USPQ 409] (Fed. Cir. 1984). The fact that the patent office issued a patent for the NES PPU does not alter my conclusion that a reasonable jury could conclude that the PPU is equivalent to a "bit-map" display system under the doctrine of equivalents.

As a final basis for attacking the jury's doctrine of equivalents conclusion, Nintendo argues that Alpex failed to explain equivalence fully, as required under *Lear Siegler*, 873 F.2d 1422 [10 USPQ2d 1767]. The *Lear Siegler* court outlined the following requirements for proof under the doctrine of equivalents:

Thus, while infringement under the doctrine requires "only" substantial identity, substantial identity must be proven with regard to all three elements of the doctrine specified in *Graver Tank*: function performed, means by which function is performed, and result achieved. In order to assure such separate analysis, . . . a jury must be separately

directed to the proof of each *Graver Tank* element. The party asserting infringement must present "evidence and argument concerning the doctrine and each of its elements". The evidence and argument on the doctrine of equivalents cannot merely be subsumed in plaintiff's case of literal infringement. Accordingly, the fact that there was evidence and argument on literal infringement, that may also bear on equivalence, does not satisfy *Nestier*.

Id. at 1425 (quoting and citing *Nestier Corp. v. Menasha Corp.-- Lewisystems Division*, 739 F.2d 1576 [222 USPQ 747] (Fed. Cir. 1984), cert. denied, 470 U.S. 1053 (1985)). Both *Lear Siegler* and *Nestier* are distinguishable from this case. In *Lear Siegler*, the only testimony that the plaintiff could point to supporting its doctrine of equivalents case was cross-examination testimony of its expert on the structural differences between the claimed invention and the accused product. *Lear Siegler*, 873 F.2d at 1426. In *Nestier*, plaintiff's expert refused to state an opinion with respect to equivalence, and plaintiff's trial counsel disavowed any theory of infringement under the doctrine of equivalence. *Nestier*, 739 F.2d at 1580. In this case, although Mr. Milner's testimony regarding equivalence under the doctrine of equivalents was brief, it was substantially more thorough than that offered in either *Lear Siegler* or *Nestier*. In response to questions from counsel, Mr. Milner testified that the NES performs substantially the same function, in substantially the same way, to achieve substantially the same result as each of the elements of claim 12. (Tr. 1912-15) Noting that dependent claim 13 incorporates the same elements as claim 12, adding two additional requirements, he testified that the NES also infringes claim 13 under the doctrine of equivalents. (Tr. at 1915) Viewed in isolation, Mr. Milner's testimony may appear conclusory. Even so, it is more extensive than that considered in *Lear Siegler* and *Nestier*. Moreover, Mr. Milner's testimony must be viewed in the context of his more lengthy discussion of equivalence under section 112(6) discussed *supra*. Before pronouncing his conclusions with respect to the doctrine of equivalence, Mr. Milner explicitly incorporated his previous section 112(6) testimony by reference. (Tr. 1912) Although proof for purposes of the doctrine of equivalents should not be completely subsumed into proof of literal infringement, *Lear Siegler*, 873 F.2d at 1425, in a case involving equivalence analyses under both section 112(6) and the doctrine of equivalents, as long as the elements of the doctrine of equivalents are explicitly reviewed for the jury, it is unnecessary for counsel to elicit wholly redundant testimony regarding equivalence. [FN11] In this case,

Mr. Milner's testimony regarding the doctrine of equivalents, together with his discussion of equivalence under section 112(6) and the argument of counsel, were sufficient to prevent the jury from being "more or less put out to sea without guiding charts when called upon to determine infringement under the doctrine." *Id.* at 1426.

For the foregoing reasons, I decline to hold as a matter of law that the jury erred in concluding that the NES video display system is equivalent (under both section 112(6) and the doctrine of equivalents) to that claimed in claims 12 and 13 of the '555 patent. To the extent that Nintendo's motion for judgment of non-infringement as a matter of law is based on these grounds, it is denied.

B. ROM Memory Element.

*1182 Nintendo maintains that the jury erred in finding infringement, not only because of differences in the video display systems at issue, but also due to differences in the ROM memory element, and the player images. Turning to Nintendo's arguments with respect to the ROM memory element, I find insufficient basis for judgment as a matter of law. As noted in the discussion of claim construction, *supra*, the court cannot conclude as a matter of law that the '555 patent requires "on-board ROM." A reasonable jury could have resolved the conflicting expert testimony in favor of Apex, as the jury did in this case, concluding that the patent does not require "on-board ROM." Accordingly, the ROM memory element does not preclude the jury's conclusion that the NES, which does not contain "on-board ROM," infringes the '555 patent.

C. Linear player image.

As a third and final basis for its motion for judgment of non-infringement as a matter of law, Nintendo claims that there was insufficient evidence for the jury to conclude that the 149 accused games infringed the linear player image and ball image elements of claims 12 and 13. For the reasons cited below, I decline to overturn the jury's verdict on this ground.

As noted *supra*, the special master recommended that the jury be instructed that there is a distinct meaning for the term. "linear player image," used in claim 12 of the patent and incorporated by reference in claim 13, as compared to the term "player image," used in other claims of the '555 patent. He recommended that any further definition of these

terms be left to the jury to decide on the basis of expert testimony that had been presented on the issue. The court adopted this portion of the Special Master's Supplemental Report and instructed the jury accordingly.

The verdict form does not reveal the jury's construction of either "linear player image" or "ball image," but the jury's infringement verdict suggests that it adopted the constructions advanced by Alpex. As noted *supra*, I cannot conclude that the construction of "linear player image" and "ball image" advanced by Alpex's expert Mr. Milner was erroneous as a matter of law. Accordingly, to the extent that Nintendo challenges the infringement verdict as impermissibly based on Mr. Milner's construction, I deny the motion.

Nintendo's motion with respect to these elements reaches beyond the question of claim construction, however. More specifically, Nintendo claims that there was no competent evidence in the record on which the jury could have found a "linear player image" and a "ball image" in the accused games. Nintendo complains that Mr. Milner played only three games for the jury, and Alpex's proof with respect to the remaining games was limited to Mr. Milner's conclusory testimony that he had played the remaining 149 accused games and found similar infringing characteristics in each of them. (Tr. 1882-90) As Nintendo recognizes, however, under Rule 705 of the Federal Rules of Evidence a patentee may rest its case on summary expert testimony that the accused product infringes the patent. See Symbol Technologies, Inc. v. Opticon, Inc., 935 F.2d 1569, 1576 [19 USPQ2d 1241] (Fed. Cir. 1991). At trial Nintendo challenged Mr. Milner's claim construction of "linear player image" and "ball image," but it did not introduce evidence rebutting the infringement conclusions he drew on the basis of that construction. As noted *supra*, I have rejected Nintendo's objections with respect to claim construction of these elements. As for the infringement analysis, Nintendo cannot now recoup for its failure to introduce evidence rebutting Mr. Milner's testimony that each of the accused games contains a "linear player image" and a "ball image," as he construed those terms. *Id.* To the extent that Nintendo challenges the jury's infringement verdict on the basis of these elements, Nintendo's motion must be denied.

To summarize, I read the jury's answer to question number one on the verdict form as reflecting a construction of the video display technology claimed in claims 12 and 13 as one that operates as a "bit

map" system. To the extent that this was not the jury's conclusion, its claim construction of that element is overruled. I cannot conclude, however, that the jury's construction of the ROM memory element, or the "linear player image" and "ball image" elements was erroneous as a matter of law. Both of these latter claim construction issues presents a dispute of fact best left to the jury. A reasonable jury could resolve those disputes as the jury did in this case, and find these elements present in the NES when used together with the game cartridges. Similarly, a reasonable jury could conclude, as I believe the jury did here, that the NES PPU is an equivalent to a bitmap system. For these reasons, Nintendo's motion for judgment of non-infringement as a matter of law is hereby denied.

IV. Validity.

Nintendo also challenges the jury's conclusion that the '555 patent is valid. Nintendo *1183 maintained at trial that the '555 patent is invalid as obvious, under 35 U.S.C. Section 103. A patent claim is invalid as obvious if the invention set forth in the claim would have been obvious to persons of ordinary skill in the art at the date of invention. See e.g., Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1574 [1 USPQ2d 1081] (Fed. Cir. 1986). The factors relevant to a finding of obviousness or non-obviousness were set forth by the Supreme Court in Graham v. John Deere Co., as follows:

Under Section 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.

383 U.S. 1, 17-18 [148 USPQ 459] (1966). Obviousness is ultimately a question of law for the court, to be based upon the factual underpinnings set forth in Graham. See Jurgens v. McKasy, 927 F.2d 1552, 1558 [18 USPQ2d 1031] (Fed. Cir.), cert. denied, 112 S.Ct. 281 (1991). Where, as in this case, the ultimate legal question of obviousness was submitted to the jury, the court can review that legal

conclusion *de novo* on a motion for judgment as a matter of law. See *id.*, at 1557-58. The court must be more deferential, however, to the jury's resolution of the underlying factual issues outlined in *Graham*. With respect to those issues, the court's inquiry on a motion for judgment as a matter of law is limited to analysis of whether the jury's verdict was supported by "substantial evidence," that is, "such relevant evidence from the record taken as a whole as might be accepted by a reasonable mind as adequate to support the finding under review." *Orthokinetics, Inc.*, 806 F.2d at 1571. Notably, the factual findings underlying a conclusion of obviousness must be demonstrated by clear and convincing evidence, and this burden falls on the party challenging the validity of the patent, *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 716 [21 USPQ2d 1053] (Fed. Cir. 1991) - in this case, Nintendo.

The jury answered a number of questions on the jury verdict form specifically directed to the ultimate question of whether claims 12 and 13 were obvious. First, the jury concluded that Alpex had "proven by clear and convincing evidence that the invention claimed in claims 12 and 13 of the '555 patent was invented before March 12, 1975, the date the patent application was filed," and that in fact Alpex had proven by clear and convincing evidence that the invention date was "on or before July 21, 1974." Liability Verdict Form, at 6. Asked whether Nintendo had "proven that the scope and content of the prior art relied on by Nintendo was more relevant to the '555 patent than the prior art considered and cited by the patent office examiner when he was considering whether to issue the '555 patent," the jury answered "no." *Id.* Addressing secondary considerations relevant to obviousness, the jury concluded that (1) the alleged invention had been commercially successful, (2) the alleged invention had satisfied a long felt need in the art, (3) others had tried and been unsuccessful in making the alleged invention, (4) the alleged invention had received praise from others in the art, (5) the alleged invention departed from accepted principles of the art, (6) the alleged invention was copied by others, including the accused infringer, (7) the alleged invention initially invoked skepticism from others possessing ordinary skill in the relevant art, and (8) a person or group working independently of the inventors had not arrived at the same or essentially the same concept as the inventors at about the same time. *Id.* at 6-8. Finally, the jury was asked the ultimate question of obviousness:

Taking Claim 12 and 13 separately, and considering

each claim as a whole, in view of (1) the scope and content of the prior art, (2) the difference between the prior art and the claims at issue, (3) the level of skill in the art, and (4) [secondary considerations noted above], has Nintendo proven by clear and convincing evidence that the asserted claims would have been obvious when the claimed invention was made to a person having ordinary skill in the art to which the claimed subject matter pertains?

Id. at 8. With respect to both claims 12 and 13, the jury answered this question "no," finding both claims non-obvious. *Id.*

In its motion for judgment of invalidity as a matter of law, Nintendo challenges a number of the jury's factual determinations, as well as its ultimate conclusion with respect to obviousness. More specifically, Nintendo asserts that the jury erred with respect to (1) identification of the prior art, (2) relevance of the prior art cited by Nintendo and (3) seven of the eight secondary considerations. Below, the court considers each of these issues to determine whether or not the jury's *1184 conclusions were supported by substantial evidence, and ultimately, to make its own determination with respect to obviousness.

A. Identification of the Prior Art.

Part of the obviousness analysis involves comparison of the prior art to the patented invention, and to the prior art cited to the patent office. Nintendo relies primarily on three pieces of prior art: (1) an August 1974 issue of *Computer* magazine, containing an article discussing the Flexible Recreational and Educational Device ("FRED"), developed by Radio Corporation of America ("RCA") in the early 1970s; (2) the FRED system itself, as described and demonstrated at trial by RCA research scientists who worked on the system in the 1970s; and (3) a September 1973 issue of *People's Computer Company Newspaper*, containing an article about a microprocessor-based home computer system.

As part of its motion for judgment of invalidity as a matter of law, Nintendo argues that the jury erroneously ignored all three of these pieces of prior art. With respect to the *Computer* magazine article on FRED, Nintendo argues that in concluding that the date of invention was on or before July 21, 1974, the jury necessarily excluded the August 1974 article from the prior art. As for the *People's Computer Company* article, Nintendo claims that the jury must

have disregarded it as insufficiently accessible to the public to constitute relevant prior art. Finally, with respect to the FRED prior art, Nintendo maintains that the jury erroneously ignored it because it believed FRED to be too experimental to constitute prior art. Such issues -- relating to identification of the prior art -- constitute questions of law for the court. See *General Motors Corp. v. United States Int'l Trade Comm'n*, 687 F.2d 476, 482 & n.11 [215 USPQ 484] (C.C.P.A. 1982), cert. denied, 459 U.S. 1105 (1983). The jury's factual determinations underlying these questions of law are, however, reviewed under the more deferential, substantial evidence test. See *Jurgens*, 927 F.2d at 1557. Applying these standards, the court reviews the jury's efforts to identify the prior art, as revealed in its validity findings.

1. Computer Magazine Article on FRED.

Nintendo assails the jury's validity findings on the ground that the jury erroneously concluded that the date of invention was on or before July 21, 1974, and therefore disregarded pertinent and invalidating prior art revealed in the August 1974 *Computer* magazine article. For the following reasons, I find Nintendo's objections unfounded. First, I cannot conclude that the jury erred in finding the date of invention was on or before July 21, 1974. Second, notwithstanding the jury's conclusion with respect to the date of invention, the jury may have considered the August 1974 *Computer* magazine article as prior art, given testimony of the magazine's availability typically preceding the month printed as the magazine date. Third, even if the jury concluded that the article itself did not constitute prior art, the contents of the article were before the jury in the form of testimony regarding the FRED prior art. Fourth, even if the jury erroneously ignored the article, I cannot conclude that a reasonable jury considering the article as prior art would have necessarily reached different conclusions regarding its relevance. These conclusions are spelled out in detail below.

The date of invention is presumed to be the date the patent application was filed with the Patent and Trademark Office ("PTO"), see Chisum, 3 *Patents* Section 10.03 [1] [c], in this case March 12, 1975. To establish an earlier date of invention, the patentee must show, by clear and convincing evidence, either an earlier reduction to practice or an earlier conception, followed by diligent reduction to practice. *Id.* Conception is defined as

"the complete performance of the mental part of the

inventive act. All that remains to be accomplished, in order to perfect the act or instrument, belongs to the department of construction, not invention. It is therefore the formation, in the mind of the inventor of *a definite and permanent idea of the complete and operative invention, as it is thereafter to be applied in practice*, that constitutes an available conception, within the patent law."

Coleman v. Dines, 754 F.2d 353, 359 [224 USPQ 857] (Fed. Cir. 1985) (quoting *Gunter v. Stream*, 573 F.2d 77, 80 [197 USPQ 482] (CCPA 1978)).

At trial, Alpex advanced an invention date of April 1974 (Tr. 3817), offering the coinventors' testimony that they started talking informally about the invention in February 1974 (Tr. 407-08), and that they conceived of the elements of the invention in discussions between February and April 1974. (Tr. 413-16; 437-41; 726, lines 11-13; 1029-55; 1057-65) According to Mr. Kirschner, he pitched the idea of the invention to Norman Alpert, president of Alpex, at a meeting in early May 1974. (Tr. 442-46) On June 24, 1974, Mr. Kirschner went to work for Alpex to conduct a two-month feasibility study of the invention (Tr. 451-55), and October 10, 1974, Mr. Haskel joined Mr. Kirschner at *1185 Alpex to develop a working model of the invention. (Tr. 475-77; 1065). Mr. Kirschner testified that when Mr. Haskel joined Alpex, Kirschner told him that the invention they were to develop was essentially the invention they had conceived the preceding February through April. (Tr. 478)

As Nintendo correctly observes, the testimony of inventors, standing alone without corroboration, is insufficient to establish an earlier invention date by clear and convincing evidence. See *Price v. Symsek*, 988 F.2d 1187, 1194 [26 USPQ2d 1031] (Fed. Cir. 1993). The court instructed the jury regarding this corroboration requirement. (Tr. 3976) As Alpex conceded, it did not have any evidence to corroborate the April invention date. (Tr. 3907) Accordingly, the earliest date of invention suggested to the jury on the jury verdict form was "on or before July 21, 1974," the date on a document containing notes about the invention written by Alpex president Norman Alpert. The alternative dates presented to the jury were "on or after October 10, 1974," and "any other date (if so, fill in the date)." As noted above, the jury chose "on or before July 21, 1974."

On the one hand, Alpex argues that substantial evidence supports the factual findings underlying the jury's conclusion that the date of invention was on or

before July 21, 1974, and that that conclusion was not reached in error as a matter of law. Nintendo, on the other hand, claims that the July 21, 1974 invention date is insufficiently corroborated, and the date of invention must be on or after October 10, 1974 as a matter of law. Conception and invention are questions of law that the court may review *de novo*, but the jury's findings of fact underlying those legal conclusions are reviewed deferentially. See *Hybritech Inc. v. Monoclonal Antibodies, Inc.* 802 F.2d 1367, 1376 [231 USPQ 81] (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987). The jury's factual findings include those explicitly stated in response to interrogatories, and the other findings necessary to support their conclusions. See *Trans - World Mfg. Corp. v. Al Nyman & Sons, Inc.*, 750 F.2d 1552, 1558 [224 USPQ 259] (Fed. Cir. 1984). In this case, factual issues underlying the date of invention include among others, the credibility of the witnesses in light of corroborating evidence and the date attributable to certain corroborative evidence, most notably the LEAD specification introduced as Plaintiff's Exhibit 617. The court reviews these factual determinations for substantial evidence, and only thereafter gives *de novo* review to the legal conclusion of conception.

In light of the court's instruction on corroboration, the jury is presumed to have found sufficient corroboration for the July 21, 1974 date. The court considers, therefore, whether that finding was supported by substantial evidence. I agree with Nintendo that the July 21, 1974 Alpert notes standing alone do not sufficiently corroborate the inventors' testimony to support a finding by clear and convincing evidence that the invention was conceived on or before July 21, 1974. "Conception must be proved by corroborating evidence which shows that the inventor disclosed to others his 'completed thought expressed in such clear terms as to enable those skilled in the art' to make the invention." *Coleman*, 754 F.2d at 359 (quoting *Field v. Knowles*, 183 F.2d 593, 601 [86 USPQ 373] (CCPA 1950)). Mr. Alpert's notes, introduced as Plaintiff's Exhibit 611B, merely contain references to various games being contemplated, the rotation feature of the games, and the shape of the player images. (Tr. 463-67) They contain no reference to a microprocessor or to replaceable memory. (Tr. 609) No reasonable jury could conclude that these notes alone sufficiently corroborate the inventors' testimony to support a conclusion that at the time the notes were written all that remained to be accomplished was construction, not invention. [FN12]

Although the July 21, 1974 Alpert notes standing alone provide insufficient corroboration, one must recall that the corroboration requirement is tempered by a "rule of reason" analysis, pursuant to which "[a]n evaluation of *all* pertinent evidence must be made so that a sound determination of the credibility of the inventor's story may be reached." *Price*, 988 F.2d at 1195. Other documents predating July 21, 1974 that were introduced into evidence include minutes of an Alpex *1186 board meeting cursorily referencing the project, a letter offering Mr. Kirschner a position with Alpex, Mr. Kirschner's employment agreement, and other notes taken by Mr. Alpert identifying potential employees to work on the project. While these documents support portions of Mr. Kirschner's story, none of them adequately corroborates complete conception prior to July 21, 1974, and Alpex does not suggest that they alter the quantum of corroborative evidence of that conception date. Alpex does argue, however, that a document entitled "Functional Project LEAD: Leisure Entertainment Action Development," dated August 8, 1974, corroborates the July 21, 1974 invention date. Alpex argues that the LEAD specification, which contains detailed descriptions of all of the elements of the invention, could not have been drafted from scratch between July 21 and August 8, 1974. (Tr. 3818) Alpex maintains that therefore, the LEAD specification, considered together with the July 21, 1974 notes, is sufficient corroborative evidence that conception occurred no later than July 21, 1974. Alpex Invalidity Rep. Mem., at 4. Nintendo does not suggest that the LEAD specification fails to disclose a complete idea of the invention. Rather, Nintendo questions the date attributable to the document.

Although the LEAD specification is dated August 8, 1974, there is conflicting testimony regarding whether that is the date the document was actually completed. Mr. Kirschner testified that everything contained in the document had been conceived by August 8, 1974, and that the document reflected his work during the summer of 1974. (Tr. 612-14) he testified further that the document was created to brief Mr. Alpert in preparation for a board meeting in September 1974, and to brief Mr. Haskell upon his arrival at Alpex in October 1974. (Tr. 612-13) He also testified, however, that Alpex's secretary had the habit of dating documents as of the date of their creation, and carrying that date through on subsequent revisions. (Tr. 617-18) This potentially conflicting testimony is further complicated by Mr. Haskell's concession that he did not understand how they would achieve rotation, an element claimed in

both claims 12 and 13, until several days after he joined Alpex on October 10, 1974. (Tr. 1133-34) Nintendo argues that this concession -- by the co-inventor responsible for software design, that he did not fully understand this software concept before October 10, 1974 -- indicates that the inventors did not have a definite and permanent idea of how to achieve this element before that time.

Notwithstanding Mr. Haskell's concession, the LEAD specification, dated (albeit questionably) August 8, 1974, describes a specific method for performing player rotation. Moreover, Mr. Alpert's July 21, 1974 notes reflect discussion of the rotation element (Tr. 464), suggesting that at that time, Mr. Kirschner, the author of the LEAD specification, had been working on the rotation element. Finally, Mr. Haskell testified that he learned how to achieve rotation only after joining Alpex and "after talking to Mr. Kirschner." (Tr. at 1134) In light of the foregoing, a reasonable jury could conclude that by August 8, 1974 Mr. Kirschner had written most of the LEAD specification, including the portion relating to the rotation element, and that in order to have done so, he had to have previously developed a complete understanding of each of the elements of the invention. See Tennant v. Peoria & P. U. Ry. Co., 321 U.S. 29, 35 (1944) ("Courts are not free to reweigh the evidence and set aside the jury verdict merely because the jury could have drawn different inferences or conclusions or because judges feel that other results are more reasonable.").

[3] Finding the foregoing facts supported by substantial evidence, the court is left to determine whether such facts establish a date of invention on or before July 21, 1974 by clear and convincing evidence. I find the LEAD specification, together with the July 21 Alpert notes, sufficiently corroborative of the inventors' detailed testimony regarding the scope of their discussions in the February to April time frame, to conclude by clear and convincing evidence that on or before July 21, 1974, the inventors had developed a definite and permanent idea of an operative invention such that one of ordinary skill in the art could have constructed the apparatus without unduly extensive research or experimentation. See Sewall v. Walters, 21 F.3d 411, 415 [30 USPQ2d 1356] (Fed. Cir. 1994) Accordingly, to the extent that the jury's validity conclusions were based on the July 21, 1974 invention date, those conclusions were not reached in error.

Although I do not think that it would have been

error for the jury to exclude the *Computer* magazine article from its consideration of the prior art, I doubt that it did so. First, as Nintendo notes, the date attributable to a document may be other than its publication date where extrinsic evidence is offered supporting a different date. See Canron, Inc. v. Plasser American Corp., 474 F.Supp. 1010, 1016 [203 USPQ 440] (E.D. Va. 1978), *aff'd*, 609 F.2d 1075 [203 USPQ 641] (4th Cir. 1979), *cert. denied*, 446 U.S. 965 (1980) Nintendo offered the testimony *1187 of Dr. Anthony Robbi that he typically received issues of *Computer* toward the end of the month preceding the cover date. (Tr. 2335-36) If the jury found this evidence probative of a date of publication preceding the July 21, 1974 invention date, the jury may have considered the *Computer* magazine article as prior art.

Even if the jury concluded that the August 1974 *Computer* magazine article did not in and of itself constitute prior art, the relevant information contained in the article was otherwise before the jury. As noted *supra*, the article at issue contained a description of the RCA's FRED home computer system. This article was not, however, the only evidence that Nintendo offered regarding the FRED system. In addition to the article, Nintendo presented RCA research scientists Dr. Anthony Robbi and Dr. Robert Winder, both of whom testified at length about the develop of FRED in the early 1970s. Each of these witnesses referred to the *Computer* magazine article, as well as several other documents, as corroboration for their testimony regarding the various elements of the FRED system in use by early 1974. There is no suggestion that the jury's conclusion with respect to the date of invention kept it from considering this prior art evidence. Accordingly, even if the jury did err in its July 21, 1974 invention date, this error did not preclude it from considering the prior art described in the August 1974 *Computer* magazine article.

In any event, as is discussed in detail *supra*, consideration of the *Computer* magazine article does not result in different conclusions with respect to the ultimate legal question of obviousness. Accordingly, to the extent that the jury may have erroneously excluded the article from the prior art, that error does not warrant judgment of invalidity as a matter of law. See General Motors Corp. v. United States Int'l Trade Comm'n, 687 F.2d 476, 482 [215 USPQ 484] (C.C.P.A. 1982), *cert. denied*, 459 U.S. 1105 (1983).

2. *People's Computer Company Newspaper and the FRED work.*

Nintendo also complains that the jury erroneously excluded from prior art evidence of RCA's FRED system, and an article contained in a September 1973 issue of *People's Computer Company Newspaper*. There is no suggestion that the jury's date of invention finding interfered with its assessment of these prior art references. Rather, Nintendo surmises that the jury erroneously excluded the FRED system on the ground that it was too experimental, and that the jury mistakenly ignore the *People's Computer Company* article because the jury found the article was insufficiently accessible to the public to constitute relevant prior art. There is no explicit basis in the jury's verdict for Nintendo's suspicion that the jury disregarded this prior art. As Nintendo notes, there was substantial un rebutted evidence that FRED was not abandoned, suppressed or concealed, but rather that it was fully developed and demonstrated to the public on several occasions. Similarly, the un rebutted evidence established that the *People's Computer Company* article was accessible to the public, with over 1,000 paid subscribers and distribution of over 5,000 copies of each issue to other publications, universities, libraries, and professional organizations. In light of the record evidence, Alpex does not contend that the jury could have ignored either the FRED work or the *People's Computer Company* article. In order to have done so, the jury would have had to ignore my instructions, which Nintendo cites as correctly stating the law regarding identification of prior art. See Nintendo's Invalidity Mem., at 16, 23. The jury is presumed to have followed the court's instructions. See *United States v. Pforzheimer*, 826 F.2d 200, 205 (2d Cir. 1987). As is discussed in detail below, the jury's conclusions with respect to relevance of the prior art and obviousness are not inconsistent with consideration of the FRED prior art and the *People's Computer Company* article. Accordingly, I cannot conclude that the jury's validity-related findings do not reflect consideration of both the FRED work and the *People's Computer Company* article. To the extent that Nintendo's motion for judgment of invalidity as a matter of law is based on the contention that the jury overlooked this prior art, the motion must be denied.

B. Scope and Relevance of the Prior Art.

[4] None of the prior art references was considered by the PTO in conjunction with prosecution of the '555 patent. By relying on this prior art, Nintendo seeks to take advantage of the rule that "one may invalidate a patent more easily with prior art not

considered by the examiner." *Jurgens*, 927 F.2d at 1558. In answer to an interrogatory directed to this issue, the jury concluded that the prior art cited by Nintendo was not more relevant than that considered by the PTO. Nintendo contends that in reaching this conclusion the jury erred as a matter of law. For the reasons stated below, I uphold the jury's verdict on this point.

*1188 Nintendo argues that the jury unreasonably concluded that the Alpex invention was distinguishable from the prior art. Nintendo argues that the evidence unequivocally establishes that the FRED prior art contained each of the elements of the invention disclosed in claims 12 and 13 of the '555 patent. More specifically, in the FRED prior art, Nintendo identifies an apparatus for playing games on a television set, using a microprocessor, bit map display memory, manually operable game control means, replaceable memory, on-board ROM, and multiple game playing capacity. As for the rotation element of the Alpex invention, Nintendo cites testimony of several witnesses that rotation was widely known in the art at the time of the Alpex invention. In contrast, Alpex maintains that the prior art lacks several critical elements of the Alpex invention. Alpex claims that the evidence regarding the FRED prior art does not establish that FRED had (1) a linear player image; (2) a ball image; (3) rotation; (4) a microprocessor; or (5) replaceable ROM. Of these elements allegedly missing from FRED, Alpex finds only replaceable ROM revealed in the *People's Computer Company* article. On the basis of these alleged distinctions, Alpex asserts that a reasonable jury could conclude that the prior art cited by Nintendo was neither more relevant than that considered by the PTO, nor sufficiently analogous to the Alpex invention to render it invalid as obvious. A close reading of the record suggests that although Alpex may overstate its case, a reasonable jury could have found important distinctions between the prior art and the Alpex invention.

The content of the prior art is a fact question, resolution of which often turns on a jury's assessment of expert testimony. See *Bio-Rad Lab., Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 611 [222 USPQ 654] (Fed. Cir.) (noting importance of jury's role is ascertaining the content of the prior art, including discerning level of ordinary skill and assessing expert credibility), *cert. denied*, 469 U.S. 1038 (1984). Such is the case here, where the experts' characterizations of the prior art teachings differ widely. As Nintendo claims, the *Computer* magazine article regarding FRED explicitly states that FRED had been

developed "using the RCA COSMAC microprocessor." (Def's Ex. 200, at 20) Moreover, the *Computer* magazine article discloses a "linear player image" (as that term was defined by Mr. Milner) in the form of a cat's head. (Tr. 3775) The article also references games designed for FRED involving ball images, such as bowling and football. (Tr. 3774) Finally, the testimony of several trial witnesses, including the inventors and Alpex's expert Mr. Milner, confirms that methods for achieving rotation were known in the art prior to July 1974. (Tr. 3559). In light of the foregoing, no reasonable jury could conclude that the various elements of the Alpex invention were not at least separately known in the art at the relevant time.

The record is not so clear, however, that it would have been obvious to one of ordinary skill in the art to combine some of these elements as was done in claims 12 and 13 of the Alpex patent. See *In re Bond*, 910 F.2d 831, 834 [15 USPQ2d 1566] (Fed. Cir. 1990) (" '[o]bviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination' ") (quoting *Carella v. Starlight Archery and Pro Line Co.*, 804 F.2d 135, 140 [1 USPQ2d 1209] (Fed. Cir. 1986)). Specifically, Nintendo failed to adduce clear and convincing evidence that one of ordinary skill in the art would have understood how to combine the replaceable ROM revealed in the *People's Computer Company* article with a microprocessor-based system such as FRED. Nintendo argues that it need not demonstrate the use of replaceable ROM in the prior art, and that it is sufficient to show that other forms of replaceable memory, such as tape cassettes, punch cards, and floppy disks, had been used with FRED. This argument raises questions regarding the proper construction of the replaceable memory element, which is explicitly claimed in claim 13, and which the jury could have reasonably found within the scope of claim 12. As is discussed in greater detail *supra*, to the extent that Nintendo's motion for judgment of invalidity as a matter of law is based on a contention that no reasonable jury could have concluded that the claims require replaceable memory in the form of a replaceable ROM cartridge, that motion must be denied. First, in accordance with the court's construction, with which the parties have agreed, the replaceable memory element of the claims must be ROM. Second, there was substantial evidence at trial to support further construction of this replaceable memory as pluggable ROM cartridges.

Thus, a reasonable jury could have concluded that claims 12 and 13 cover replaceable memory in the form of a pluggable ROM cartridge. Nintendo has failed to prove by clear and convincing evidence that the prior art it cites teaches use of such replaceable ROM with a microprocessor-based home video game system. First, the *People's Computer Company* article standing*1189 alone does not necessarily indicate that it was known in the art how to achieve this combination. The article presents a cursory outline of a proposed home computer system, concluding with an invitation for "discussions or other arrangements towards the realization of this idea." (Def. Exh. 240, at 5) As an alternative, Nintendo argues that the FRED prior art teaches the use of replaceable ROM with a microprocessor-based system. As the basis for this argument, Nintendo points to a reference to ROM in the *Computer* magazine article. The relevant reference in the *Computer* magazine article states: "Other possible attachments [for FRED] include light guns, extra memory (RAM), pre-stored programs or tables (ROM), and output relays for control uses." (Def. Exh. 200, at 21) Testifying for Nintendo, Dr. Anthony Robbi interpreted this sentence as a reference to replaceable ROM to be used with the FRED system. (Tr. 2344) Alpex expert Mr. Milner testified to the contrary, however, that this statement did not necessarily refer to replaceable-ROM. (Tr. 3772-73) Moreover, Dr. Robbi admitted that researchers at RCA never actually used semiconductor ROM with the FRED home video game system. (Tr. 2322-23) A reasonable jury seeking to resolve this conflicting testimony could conclude that the prior art, including the *Computer* magazine article, did not teach use of replaceable ROM with a FRED-type system. [FN13]

Similarly, there is conflicting evidence regarding whether one of ordinary skill in the art would have known how to combine the elements of the microprocessor-based system revealed in the FRED materials with methods for achieving rotation taught by existing arcade games. (Compare Tr. 3559 with 3350-53) Indeed, the patent examiner allowed claim 12 over prior art containing rotation, specifically noting that the prior art did not teach use of the rotation element in a television game. In light of these substantial disputes over the content of the prior art, I cannot conclude that a reasonable jury would necessarily find the prior art cited by Nintendo (including the *Computer* magazine article) analogous to the invention disclosed in claims 12 and 13 of the '555 patent. Having found substantial evidence distinguishing the Alpex patent from the prior art

cited by Nintendo, I find no error in the jury's apparent decision to disregard Dr. Ward's conclusory testimony that that prior art was more relevant than the prior art considered by the PTO.

C. Secondary Considerations.

In making patent validity determinations, courts generally look to a number of secondary considerations deemed relevant to the question of obviousness. Such considerations, most of which are probative of non-obviousness, must be proven by a preponderance of the evidence. In this case, eight such factors were presented to the jury for consideration. Nintendo now challenges the jury's findings with respect to seven of those eight factors. The court reviews those findings to determine whether, on the basis of the record presented at trial, a reasonable jury could have made them. However, the presence or absence of secondary considerations is not dispositive of the question of validity, and "the weight to be accorded evidence of secondary considerations is to be carefully appraised in relation to the facts of the actual case in which it is offered." *Cable Elec. Prods. v. Genmark Inc.*, 770 F.2d 1015, 1026 [226 USPQ 881] (Fed. Cir. 1985). Accordingly, although the court may conclude that the jury reasonably found certain secondary considerations, in some instances, as noted below, the court may give these considerations less weight in its analysis of the ultimate question of obviousness.

1. Commercial Success.

[5] The initial commercial embodiment of the '555 patent was called the Channel F, a video game system marketed by Fairchild Computer Company under license from Alpex. Alpex presented no evidence of sales, profits or market share of Channel F and Nintendo's witnesses testified that it was a commercial flop. [FN14] Alpex's case for commercial success rests primarily on the success of the Nintendo NES. A patentee asserting *1190 commercial success as evidence of non-obviousness must demonstrate a sufficient relationship between the commercial success and the patented invention such that the success can be attributed to the invention. See *Demaco Corp. v. F. Von Langsdorff Licensing, Ltd.*, 851 F.2d 1387, 1392 [7 USPQ2d 1222] (Fed. Cir.), cert. denied, 488 U.S. 956 (1988). Nintendo argues that Alpex failed to make this requisite showing and that in fact, the success of the NES is attributable to Nintendo's improvements -- its high quality games, security chip, and intensive marketing efforts.

Although the success of the NES is no doubt in large part due to the contributions Nintendo has made to the basic system disclosed in the Alpex patent, I find substantial evidence upon which a reasonable jury could have concluded that the success of the NES constitutes commercial success of the '555 patent. Notably, Nintendo executives attributed their substantial profits to the interdependence of their consoles and cartridges, i.e., the use of replaceable memory in a home video game system, as is disclosed in the ' 555 patent. I will credit the jury's reasonable finding of commercial success based on this evidence. Cognizant of other factors that contributed to Nintendo's success, however, I will give this factor little weight in my determination of obviousness.

2. Long Felt Need and Failure of Others.

The jury determined that Alpex had demonstrated by a preponderance of the evidence that the invention disclosed in the '555 patent satisfied a long-felt need and accomplished something that others had tried and failed. Nintendo claims that there is insufficient evidence for a reasonable jury to find that these two secondary considerations were present in this case. The evidence relating to these two considerations is related, so the court addresses them together.

First, Nintendo maintains that there was no evidence that any need for the Alpex invention had been recognized in the industry. Alpex responds that there was substantial evidence from which a reasonable jury could find a recognized need for a home video game system that would have sufficient flexibility to permit one to play multiple games, thereby avoiding boredom with the product, a problem that had plagued the predecessor Odyssey and Pong game systems. For example, Mr. Milner testified that in 1975, he and his colleagues at Atari began work on a flexible home video game system with replaceable ROM cartridges, at least partially in response to a fall-off in sales of its dedicated home video game, Pong. (Tr. 1750-51)

Nintendo counters that any need for a multi-game system had already been met by the FRED system, developed by RCA in the early 1970s. As noted *supra*, however, the FRED home computer system did not employ replaceable ROM prior to 1975, [FN15] and RCA had struggled to find other forms of replaceable memory that would be inexpensive, effective, and not so slow as to try a user's patience. The replaceable memory most commonly used with FRED was cassette tape, which, though better than